

CLAIMS

1. A method comprising an act of:

5 (A) generating, from a dimensional metrology program, a machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller.

2. The method according to claim 1, further comprising an act of:

10 (B) the machine tool controller executing the machine tool program to produce coordinate measurement data.

3. The method according to claim 2, further comprising an act of:

15 (C) communicating the coordinate measurement data to a dimensional metrology analysis module.

4. The method according to claim 3, wherein act (C) is performed during act (B).

20 5. The method according to claim 3, further comprising an act of:

(D) the dimensional metrology analysis module analyzing the coordinate measurement data.

6. The method according to claim 5, further comprising an act of:

25 (E) generating an additional machine tool program based on results of act (D).

7. The method according to claim 6, wherein the additional machine tool program comprises instructions to control a machine tool to perform coordinate measurements.

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8. The method according to claim 6, wherein the additional machine tool program comprises instructions to control a machine tool to perform machining operations.

5 9. The method according to claim 6, wherein the additional machine tool program comprises instructions to control a machine tool to perform coordinate measurements and machining operations.

10 10. The method according to claim 5, wherein act (D) comprises the dimensional metrology analysis module analyzing the coordinate measurement data using overdetermined objective functions.

11. The method according to claim 1, wherein the dimensional metrology program is configured to control a coordinate measurement machine.

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12. The method according to claim 1, further comprising an act of:
(F) communicating the machine tool program to the machine tool controller.

13. The method according to claim 12, wherein act (F) comprises
20 communicating the machine tool program to the machine tool controller in one communication.

14. The method according to claim 1, wherein act (A) is performed by an application integrated within a control panel of the machine tool controller.

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15. The method according to claim 1, wherein act (A) comprises an act of selecting one of a plurality of machine definitions, each machine definition providing values for one or more parameters of a machine tool.

16. The method according to claim 15, wherein the values comprise at least one of: a tool offset type; a parameterized move command; and a parameterized measure command.

5 17. The method according to claim 15, wherein act (A) comprises combining the machine definition with a dimensional metrology path definition.

18. The method according to claim 2, wherein act (B) comprises the machine tool controller executing the machine tool program without receiving further
10 instructions during execution.

19. The method according to claim 2, wherein act (B) comprises the machine tool controller receiving one or more instructions regarding an offset value during execution of the machine tool program.

15 20. The method according to claim 1, wherein the machine tool program comprises G and M codes.

21. The method according to claim 1, wherein act (A) comprises
20 translating the dimensional metrology program into the machine tool program.

22. The method according to claim 1, wherein act (A) comprises an act of removing dimensional metrology program commands from the dimensional metrology program.

25 23. The method according to claim 1, wherein act (A) comprises an act of inserting into the machine tool program numeric control commands that are not present in the dimensional metrology program.

30 24. The method according to claim 1, wherein act (A) comprises an act of providing indicators within the machine tool program, the indicators including

information regarding a type of analysis to be performed on measurement data that is generated by execution of the machine tool program.

25. The method according to claim 1, wherein act (A) comprises an act of
5 providing indicators within the machine tool program, the indicators including information regarding at least one of an identification of the machine tool and an identification of the dimensional metrology program.

26. The method according to claim 1, wherein act (A) comprises an act of
10 providing indicators within the machine tool program, the indicators including information regarding identification of workpiece features to be analyzed.

27. The method according to claim 1, wherein act (A) comprises an act of
15 providing indicators within the machine tool program, the indicators including information regarding a quantity of coordinate measurements associated with a workpiece feature.

28. A system comprising:
a program generator to generate, from a dimensional metrology program, a
20 machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller.

29. The system according to system 28, further comprising an analysis
25 module to perform dimensional analysis of coordinate measurement data that result from execution of the machine tool program.

30. The system according to claim 29, further comprising a server module
to receive the coordinate measurement data from the machine tool controller and
30 communicate the coordinate measurement data to the analysis module.

31. A computer-readable medium having instructions stored thereon that, as a result of being executed by a computer, instruct the computer to perform a method comprising an act of:

(A) generating, from a dimensional metrology program, a machine tool
5 program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller.

32. The computer-readable medium according to claim 31, wherein the
10 method further comprises an act of:

(B) the machine tool controller executing the machine tool program to produce coordinate measurement data.

33. The computer-readable medium according to claim 32, wherein the
15 method further comprises an act of:

(C) communicating the coordinate measurement data to a dimensional metrology analysis module.

34. The computer-readable medium according to claim 33, wherein act (C)
20 is performed during act (B).

35. The computer-readable medium according to claim 33, wherein the method further comprises an act of:

(D) the dimensional metrology analysis module analyzing the coordinate
25 measurement data.

36. The computer-readable medium according to claim 35, wherein the method further comprises an act of:

(E) generating an additional machine tool program based on results of act (D).
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37. The computer-readable medium according to claim 36, wherein the additional machine tool program comprises instructions to control a machine tool to perform coordinate measurements.

5 38. The computer-readable medium according to claim 36, wherein the additional machine tool program comprises instructions to control a machine tool to perform machining operations.

39. The computer-readable medium according to claim 36, wherein the
10 additional machine tool program comprises instructions to control a machine tool to perform coordinate measurements and machining operations.

40. The computer-readable medium according to claim 35, wherein act (D) comprises the dimensional analysis metrology module analyzing the coordinate
15 measurement data using overdetermined objective functions.

41. The computer-readable medium according to claim 31, wherein the dimensional metrology program is configured to control a coordinate measurement machine.
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42. The computer-readable medium according to claim 35, wherein act (D) comprises performing a regression analysis of the coordinate measurement data.

43. The computer-readable medium according to claim 31, wherein the
25 dimensional metrology program is configured to provide adequate data for dimensional metrology analysis using overdetermined objective functions.

44. The computer-readable medium according to claim 31, further comprising an act of:
30 (F) communicating the machine tool program to the machine tool controller.

45. The computer-readable medium according to claim 44, wherein act (F) comprises communicating the machine tool program to the machine tool control in one communication.

5 46. The computer-readable medium according to claim 31, wherein act (A) is performed by an application integrated within a control panel of the machine tool controller.

10 47. The computer-readable medium according to claim 31, wherein act (A) comprises an act of selecting one of a plurality of machine definitions, each machine definition providing values for one or more parameters of a machine tool.

48. The computer-readable medium according to claim 31, wherein the machine tool program comprises G and M codes.

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49. The computer-readable medium according to claim 31, wherein act (A) comprises an act of removing dimensional metrology program commands from the dimensional metrology program.

20 50. The computer-readable medium according to claim 31, wherein act (A) comprises an act of inserting into the machine tool program numeric control commands that are not present in the dimensional metrology program.

25 51. The computer-readable medium according to claim 31, wherein act (A) comprises an act of including indicators within the machine tool program, the indicators comprising information regarding a type of analysis to be performed on measurement data that is generated by an execution of the machine tool program.

30 52. The computer-readable medium according to claim 31, wherein act (A) comprises an act of providing indicators within the machine tool program, the

indicators including information regarding at least one of an identification of the machine tool and an identification of the dimensional metrology program.

53. The method according to claim 31, wherein act (A) comprises an act of
5 providing indicators within the machine tool program, the indicators including information regarding identification of workpiece features to be analyzed.

54. The method according to claim 31, wherein act (A) comprises an act of
providing indicators within the machine tool program, the indicators including
10 information regarding a quantity of coordinate measurements associated with a workpiece feature.

55. A system comprising:
means for generating a machine tool program from a dimensional metrology
15 program, the machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller; and
a communication module to communicate the machine tool program to the
machine tool controller.

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56. The system according to claim 55, further comprising means for
analyzing coordinate measurement data resulting from execution of the machine tool
program on the machine tool controller.

25 57. A method comprising acts of:
(A) generating a machine tool program that includes instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller; and
(B) analyzing coordinate measurement data generated by execution of the
30 machine tool program using dimensional metrology analysis.

58. The method according to claim 57, further comprising an act of:
(C) the machine tool controller executing the machine tool program.

59. The method according to claim 58, further comprising an act of:
5 (D) receiving the coordinate measurement data on a computer during
execution of the machine tool program.

60. The method according to claim 59, further comprising an act of:
(E) communicating the coordinate measurement data to a dimensional
10 metrology analysis module.

61. The method according to claim 60, wherein the dimensional metrology
analysis module performs analysis using overdetermined objective functions.

15 62. The method according to claim 57, wherein act (A) and act (B) are
performed by an application integrated within a control panel of the machine tool
controller.

63. The method according to claim 57, wherein act (A) comprises an act of
20 selecting one of a plurality of machine definitions that each provide values for one or
more parameters of a machine tool.

64. The method according to claim 63, wherein the values comprise at
least one of: a tool offset type; a parameterized measure command; and a
25 parameterized move command.

65. The method according to claim 63, wherein act (A) comprises
combining the machine definition with a dimensional metrology path definition.

66. The method according to claim 58, wherein act (C) comprises the machine tool controller executing the machine tool program without receiving any external instructions during execution.

5 67. The method according to claim 58, wherein act (C) comprises the machine tool controller receiving external data regarding an offset value during execution of the machine tool program.

68. The method according to claim 57, wherein the machine tool program
10 comprises G and M codes.

69. The method according to claim 57, wherein act (A) comprises generating the machine tool program from a dimensional metrology program.

15 70. The method according to claim 69, wherein act (A) comprises an act of removing dimensional metrology program commands from the dimensional metrology program.

71. The method according to claim 69, wherein act (A) comprises an act of
20 inserting into the machine tool program numeric control commands that are not present in the dimensional metrology program.

72. The method according to claim 57, wherein act (A) comprises an act of providing indicators within the machine tool program, the indicators including
25 information regarding a type of analysis to be performed on measurement data that is generated by an execution of the machine tool program.

73. The method according to claim 57, wherein act (A) comprises an act of providing indicators within the machine tool program, the indicators including
30 information regarding at least one of an identification of the machine tool and an identification of a dimensional metrology program.

74. The method according to claim 57, wherein act (A) comprises an act of providing indicators within the machine tool program, the indicators including information regarding identification of workpiece features to be analyzed.

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75. The method according to claim 57, wherein act (A) comprises an act of providing indicators within the machine tool program, the indicators including information regarding a quantity of coordinate measurements associated with a workpiece feature.

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76. A system comprising:

a program generator to generate a machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller; and

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a dimensional metrology analysis module to analyze coordinate measurement data generated by an execution of the machine tool program.

77. A computer-readable medium having instructions stored thereon that, as a result of being executed by a computer, instruct the computer to perform a method comprising acts of:

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(A) generating a machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller; and

(B) analyzing coordinate measurement data generated by an execution of the machine tool program using dimensional metrology analysis.

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78. A system comprising:

means for generating a machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program is executable on a machine tool controller; and

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a dimensional metrology analysis module to analyze coordinate measurement data generated by execution of the machine tool program.

79. A method comprising an act of:

5 (A) generating, from a dimensional metrology program, a self-contained machine tool program that is executable on a machine tool controller to perform coordinate measurements without interaction with a program generator.

80. The method according to claim 79, further comprising an act of:

10 (B) downloading the machine tool program to the machine tool controller.

81. The method according to claim 80, further comprising an act of:

(C) executing the machine tool program on the machine tool controller.

82. The method according to claim 81, further comprising an act of:

15 (D) providing coordinate measurements resulting from execution of the machine tool program to a dimensional metrology analysis module.

83. The method according to claim 82, further comprising an act of:

20 (E) the dimensional metrology analysis module performing a dimensional metrology analysis of the coordinate measurements.

84. A method comprising an act of:

25 (A) generating, from a dimensional metrology program, a machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein act (A) is performed independently from any measurement data received from a machine tool controller.

85. The method according to claim 84, further comprising an act of:

30 (B) applying a set of measurement instructions regarding part features to a data model of a part to generate the dimensional metrology program.

86. A method comprising acts of:

(A) generating, from a dimensional metrology program, a machine tool program including instructions to control a machine tool to perform coordinate
5 measurements;

(B) providing at least one indicator within the machine tool program to be used by a dimensional metrology analysis module to analyze data generated by execution of the machine tool program.

10 87. The method according to claim 86, wherein act (B) includes providing at least one indicator within the machine tool program to be used by the dimensional metrology analysis module to initiate a type of analysis to perform on data generated by execution of the machine tool program.

15 88. The method according to claim 87, wherein the at least one indicator comprises information regarding a type of analysis to be performed on measurement data that is generated by an execution of the machine tool program.

20 89. The method according to claim 88, wherein the at least one indicator comprises information regarding at least one of an identification of a machine tool and an identification of the dimensional metrology program.

25 90. The method according to claim 89, wherein the at least one indicator comprises information regarding identification of workpiece features to be analyzed.

91. The method according to claim 86, wherein the at least one indicator comprises information regarding a quantity of coordinate measurements associated with a workpiece feature.

92. A computer-readable medium having instructions stored thereon that, as a result of being executed by a computer, instruct the computer to perform a method comprising acts of:

5 (A) generating, from a dimensional metrology program, a machine tool program including instructions to control a machine tool to perform coordinate measurements; and

(B) providing at least one indicator within the machine tool program to be used during dimensional metrology analysis to analyze data generated by execution of the machine tool program.

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93. A system comprising:

a program generator to generate, from a dimensional metrology program, a machine tool program including instructions to control a machine tool to perform coordinate measurements, wherein the machine tool program comprises means for
15 indicating to a dimensional metrology analysis module the type of analysis to be performed.